

I. INTRODUCTION

- The Navy plans to retest approximately 26 radiologically impacted buildings at HPNS.
- Navy workplans call for scanning impacted interior building surfaces and making static measurements at more than 10,000 locations.
- The Navy has identified one to five radionuclides of concern for each building. Ra-226 is a ROC at approximately 23 buildings; Cs-137 at approximately 22 buildings; Sr-90 at approximately 16 buildings; Pu-239 at approximately 9 buildings; Th-232 at approximately 5 buildings; Co-60 at approximately 2 buildings; and K40 at approximately one building.
- As part of a CERCLA Five Year Review, EPA and the Navy have been evaluating whether the current radiological remediation goals (RGs) are protective. EPA lacks confidence in the risk estimates used by the Navy to support its position that the RGs are protective, because of concerns about how the RESRAD BUILD calculator generates risk estimates for a contaminated surface, lack of reliable supporting data, and disagreement about certain assumptions and inputs made in the risk calculations. EPA has suggested that a protectiveness determination be deferred until the retesting data are available.
- The Navy workplans call for measurements of gross alpha radiation and gross beta radiation. (The measured radiation will not be attributable to a particular radionuclide.) For each building, the gross alpha measurements will be compared to the lowest limit for the alpha-emitting ROCs associated with the building. Similarly, each gross beta measurement will be compared to the lowest limit for beta-emitting ROCs associated with the building.
- The retesting data must be of sufficient quality to demonstrate compliance with RGs and that activity levels on interior building surfaces correspond to less than 1×10^{-4} risk (whichever is lower). EPA believes that the measurement MDCs/count times proposed in Navy workplans for retesting need to be lowered to meet these goals. The table below lists MDCs corresponding to 1×10^{-4} risk ("EPA Site-specific") for each radionuclide of concern, along with MDCs based on the current RGs.
- We expect the MDCs for removable contamination to require longer sample count times than 1 to 2 minutes assumed in Navy workplans. We estimate, based on testing completed by Dave Kappelman of EPA's Environmental Response Team, that achieving the Ra-226 MDC would require a count time of up to 30 minutes and may require a different counting method or instrument. Our count time estimates assume 100% loss of radon. We do not believe it is appropriate to assume the presence of radon and radon progeny in determining count times for measurements of removable contamination in the absence of site-specific evidence indicating their presence.
- We expect the sample count times required for total (static) measurements to be achievable with little or no change from the 1 to 2 minutes estimated in Navy workplans. With one change, we agree with the assumption made in the Navy workplan about the presence of radon and radon progeny in estimating Ra-226 and Th-232 MDCs and determining count times. The Navy assumes the presence of 100% of Rn220 and Rn222, 40% of Rn222 daughters, and 2% of Rn 220 daughters. We believe it is appropriate to assume that 40% of Rn222 and 2% of Rn 220 are present (rather than 100%).
- We expect minimal changes to scanning but the frequency of static sampling should be reevaluated if scanning MDCs are insufficient.

- MDCs achieved in the field need to be less than the MDCs listed in the following tables. The MDCs in the tables represent 1×10^{-4} risk for the removable contamination, and 1×10^{-4} risk for total measurements. Actual MDCs should allow the retesting data to be used to demonstrate that the combined risk from the removable and total contamination does not exceed 1×10^{-4} risk. Accordingly, one or both (removable and/or total) actual MDCs are expected to be below the table values.

II. MDCs FOR REMOVABLE CONTAMINATION (dpm/100cm²)

Radionuclide (note 1)	Risk-based MDCs, EPA Site-specific Estimates (note 2)	MDCs based on 20% of RGs (note 4)
Gross Alpha		
Pu-239	35.7	20
Ra-226	1.44	20
Th-232 (note 3)	8.41 (3 x 2.80)	21.8 (3 x 7.3)
Gross Beta		
Co-60	754	1000
Cs-137	253	1000
Sr-90 (note 3)	162 (2 x 81)	400 (2 x 200)

Notes to table:

(1) Am241, Eu152, Eu154, H3 and U235 are not included in table since they do not appear to be ROCs at any of the buildings planned for retesting.

(2) "Risk Based MDCs, EPA Site-specific Estimates" are minimum MDCs required to detect contamination at 1×10^{-4} risk based on the BPRG calculator with ingestion parameters adjusted to lower the "age-adjusted dust ingestion rate [IFD_{res-adj}]" from 320m² to 273m². This site-specific assumption raises the BPRGs/MDCs by about 17% (320/273) compared to default values.

The adjusted dust ingestion rate is based on the following assumptions:

- Ingestion of 100% of the residual removable fraction in a future residence.
- Residual radiological contamination uniformly present on the impacted floor and walls of each building. (For some buildings, only selected surfaces are considered impacted.).
- A future residence size equal in square footage to the largest unit constructed on Parcel A (2,187 ft²). Use of a 90th or 95th percentile would slightly decrease this value.
- Residence makes use of the floor and two 8'-high impacted walls, giving a total interior area of 2,935 ft² (273 m²). Ceiling assumed unimpacted. This assumption of two walls is appropriate for the Parcel G buildings but may not be appropriate for the smallest buildings or buildings suspected of burning contaminated fuel oil (Parcels C and UC-1). If the assumption of floor + four walls, or floor + four walls + ceiling, were appropriate, the assumed area would increase to 320m², the default area assumed in the BPRG calculator.

(3) Except for Sr-90, and Th232, the EPA Site-specific MDCs are equivalent to the BPRGs.

- For Th-232, the alpha MDC is 3 x the PRG or RG (3 x 2.80 dpm/100cm²) to account for the presence of three alpha emitters (Th-232 and two daughters Th-228 and Ra-224).
- For Sr-90, the beta MDC is 2 x the PRG (2 x 81 dpm/100cm²) to account for the presence of two beta emitters (Sr-90 and its daughter Y-90).

The adjustment for Th-232 is based on the assumed loss of 100% of the radon. This is a more conservative assumption than the Navy makes and has a significant impact on the Ra-226 and Th-232 MDCs. The Navy MDCs assume the presence of 100% of Rn220 and Rn222, 40% of Rn222 daughters, and 2% of Rn 220 daughters.

(4) Except for Th-232 and Sr-90, the “MDCs based on 20% of RGs” are equal to 20% of the RGs. The Th-232 and Sr-90 values are adjusted as described in note (3).

(5) The lower of the “Risk Based MDCs, EPA Site-specific Estimates” and “MDCs based on 20% of RGs” are highlighted in red font.

III. MDCs REQUIRED FOR STATIC (TOTAL) MEASUREMENTS (dpm/100cm2)

Radionuclide (note 1)	Risk-based MDCs, EPA Site-specific Estimates (note 2)	MDCs based on 20% of RGs (note 4)
Gross Alpha		
Pu-239	1.73×10^7	100
Ra-226 (note 3)	876 (2.6×337)	260 (2.6×100)
Th-232 (note 3)	522 (3.07×170)	112 (3.07×36.4)
Gross Beta		
Co-60	548	5000
Cs-137	1743	5000
Sr-90 (note 3)	1.0×10^9 ($2 \times 5.24 \times 10^8$)	2,000 (2×1000)

Notes to table:

(1) Am241, Eu152, Eu154, H3, and U235 are not included in table since they do not appear to be ROCs at any of the buildings planned for retesting.

(2) “Risk-based MDCs, EPA Site-specific Estimates” estimates are minimum MDCs required to detect contamination at 1×10^{-4} risk based on the online BPRG calculator with the following site-specific assumptions:

- Room size assumed to be 100 x 100 feet. This is larger than the residence size used in the ingestion risk calculations (47 x 47') to account for external radiation that could originate in an adjoining residence. The BPRG calculator provides risk estimates for five room sizes (10' x 10', 50' x 50', 100' x 100', 200' x 200', and 400' x 400').
- Building material assumed as concrete (most conservative), average receptor location

The MDCs assume residual radiological contamination is uniformly present on all six interior surfaces. This is a more conservative than the assumptions made in the ingestion risk calculations because the BPRG calculator does not allow the user to assume that only some surfaces are contaminated. If available, we would assume floor and two walls for most (but not all) of the Parcel G buildings.

(3) The EPA Site-specific MDCs are equivalent to the BPRGs except for the following:

- The Sr-90 MDC is $2 \times$ the PRG ($2 \times 5.24 \times 10^8$ dpm/100cm2) to account for the presence of the beta-emitting daughter Y-90.
- The Th-232 MDC is $3.07 \times$ the PRG (3.07×170 dpm/100 cm2) to account for the presence of alpha emitting Th-232 progeny.

- The Ra-226 MDC is 2.6 x the PRG ($2.6 \times 337 \text{ dpm}/100\text{cm}^2$) to account for the presence of alpha-emitting Ra-226 progeny.

(4) Except for Ra-226, Th-232 and Sr-90, the "MDCs based on 20% of RGs" are equal to 20% of the RGs. The Ra-226, Th-232 and Sr-90 values are adjusted as described in note (3).